

Status of the Development and Deployment of the NCSP Training and Education Courses for FY17

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NCSP Technical Program Review
Oak Ridge National Laboratory
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Agenda

- Course objectives and offerings
- Two-week hands-on course update
- One-week hands-on course update
- Course statistics

US DOE Nuclear Criticality Safety Program (NCSP) T&E Course Vision*

- T&E Vision:

This NCSP element will identify, develop, provide, and promote practical and excellent technical training and educational resources that help ensure competency in the art, science and implementation of nuclear criticality safety and is adaptable and responsive to the needs of those responsible for developing, implementing, and maintaining criticality safety.

* *The Mission and Vision of the United States Department of Energy Nuclear Criticality Safety Program for the Fiscal Years 2014–2023*
(http://ncsp.llnl.gov/NCSP_MISSION_VISION_FY14-23.pdf).

T&E General Course Objectives*

- Provide a consistent level of DOE interpretation, understanding, awareness and applications regarding
 - DOE Orders, Guides, ANS Standards, Rules
 - Performance of Criticality Safety Evaluations
 - Hazards Analysis Methods and Implementation/maintenance of NCS Controls including precision and uncertainty of NDA and DA requirements
- Ensure versatility for cleared and un-cleared students
- Provide alternate/backup facility capabilities for hands-on training
- Provide experimental hands-on training addressing
 - Characteristics of Neutron Multiplying Systems
 - Discussion of
 - Reactor dynamics
 - Implications for the Safety of Fissionable Material Operations

* CSSG Tasking 2009-03, *Recommendations for the Future DOE NCSP Training and Education Infrastructure Program.*

NCSF Training and Education Courses

Hands-On Course
(2 weeks)

Manager Course
(1 week)

Special Courses
(1 week)

Criticality Safety Officer Course
(1 week)

Development begins in FY19

Classroom Training
Nevada Field Office /
National Atomic Testing
Museum (NATM)

National Criticality
Experiments
Research Center
(NCERC)

NCERC

NCERC

Week 1

Hands-On
Training
NCERC

Hands-On
Training
Sandia

Sandia

Week 2

Sandia

Two-week hands-on course: Week 1, classroom portion

Focus: NCS evaluation (NCSE) development

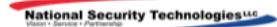
- DOE requirements, national standards, and DOE NCSP
- Processing criticality accident lessons-learned
- NCS fundamentals
- ANSI/ANS-8 consensus standards
- Single unit and array hand calculation methods
- NCS evaluations and **evaluation exercise**
- Human factors and reliability principles for NCS evaluations
- Nondestructive assay (NDA) – interpretation and application of NDA methods and results to NCSEs
- Validation of computational methods
- Daily homework and quizzes
- Passing requirement: overall grade of 80%



NFO Class Photo



NATM Class Photo



NCSE exercise augmentation for the NFO portion of the two-week course

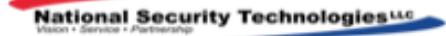
NCSE Exercise (~12.5 hours)

- NCSE Lecture 1 – Intro to normal conditions
 - Workshop 1 – Develop a process description and define normal conditions using a hypothetical process
- NCSE Lecture 2 – Intro to credible abnormal conditions
 - Workshop 2 – Determine the credible abnormal conditions for the hypothetical process
- NCSE Lecture 3 – Control selection
 - Workshop 3 – Develop controls for the hypothetical process
- Workshop 4 – Student presentations of control sets for the hypothetical process
- Workshop 5 – Review complete NCS evaluations for the hypothetical process and discuss as a class

New module and exercise for Emergency Response and the Criticality Accident Slide Rule – developed in FY17 & FY18Q1



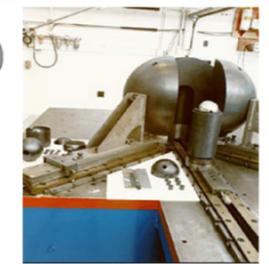
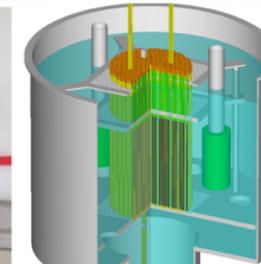
National Nuclear Security Administration



Two-week hands-on course: Week 2, hands-on portion

Focus: NCSE development

- Overview of Sandia and NCERC facilities and assemblies
- Overview of the experiment procedures and methodology
- Neutron dynamics fundamentals and subcritical multiplication
- Nuclear instrumentation
- ANSI/ANS-1 *Conduct of Critical Experiments*
- Lessons learned from experimental criticality accidents
- **Subcritical** and **critical** experiments
 - NCERC – operations with **Planet**, **Flattop**, **Godiva IV**, **BeRP Ball**, ^{237}Np Sphere, and **Training Assembly for Criticality Safety (TACS)**
 - Sandia – **Seven percent critical experiment (7uPCX)**, **Annular Core Research Reactor Core (ACRR) burst**
- Critical experiments and the International Criticality Safety Benchmark Evaluation Project (ICSBEP) handbook
- Passing requirement: overall grade of 80%

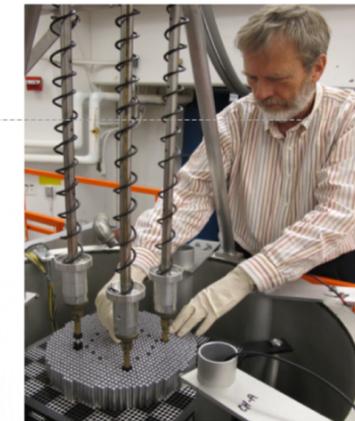
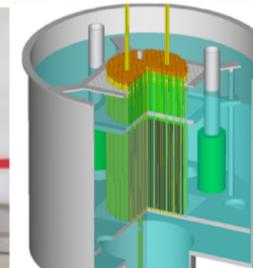
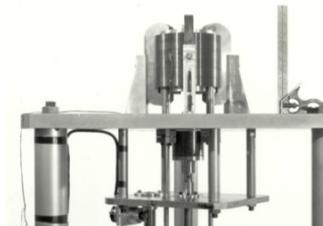


Aug. 2015 Class Photo

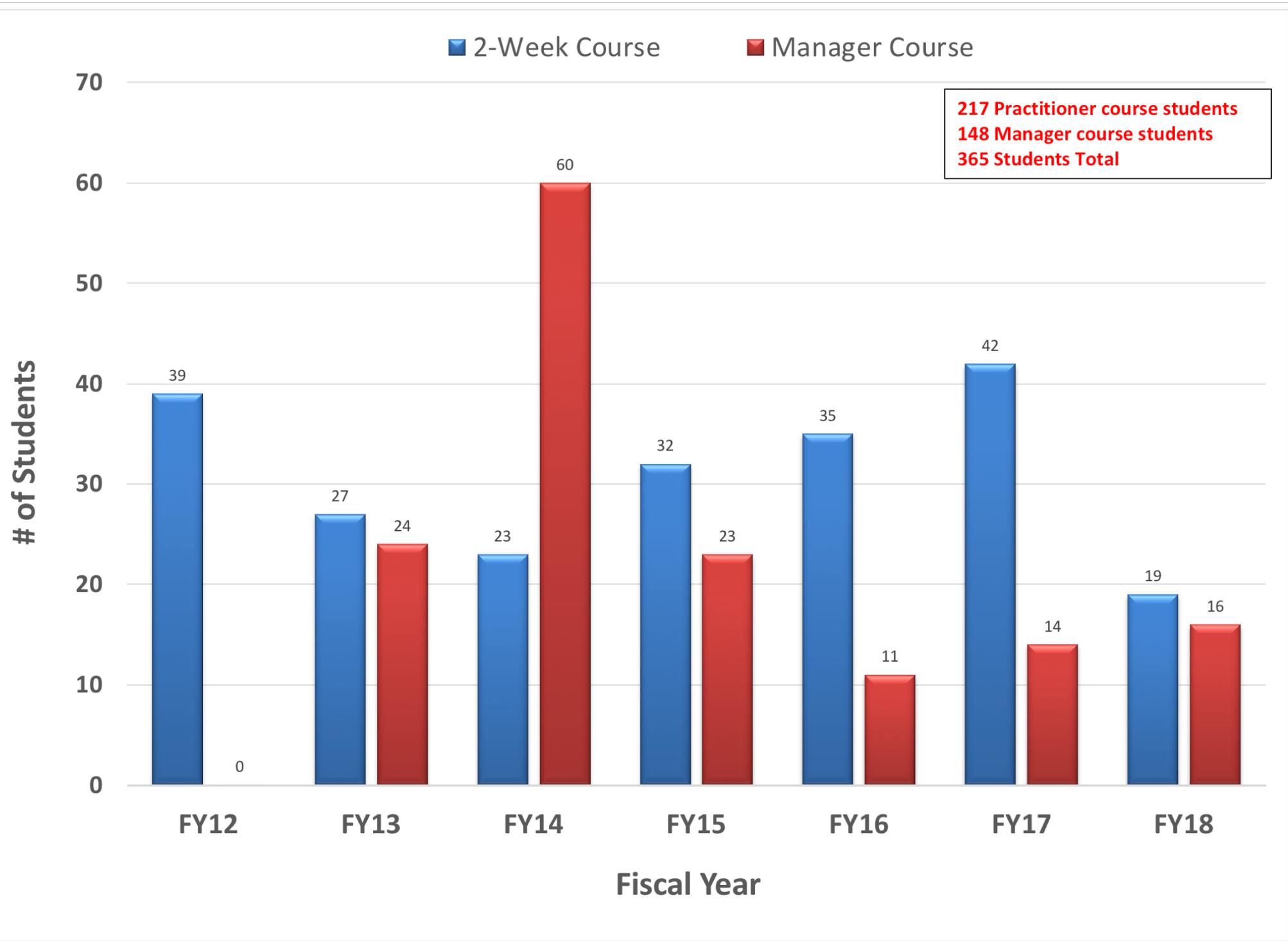
One-week manager course

Focus: understanding the student's role in an NCS program

- DOE requirements, national standards, and the DOE NCSP
- Overview of Sandia and NCERC facilities, assemblies, and experiment procedures and methodology
- Neutron dynamics fundamentals and subcritical multiplication
- Nuclear instrumentation; conduct of operations
- ANSI/ANS-1 & 8 consensus standards
- NCSEs
- Lessons learned from criticality accidents
- Subcritical and critical experiments
 - NCERC – Ops with Planet, Flattop, Godiva IV, BeRP Ball, ^{237}Np Sphere, and Training Assembly for Criticality Safety (TACS)
 - Sandia – Seven percent critical experiment (7uPCX), Annular Core Research Reactor Core (ACRR) burst
- Passing requirement: overall grade of 80%



Course Statistics



Acknowledgements

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Are there any questions?

